

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-200249

(43)Date of publication of application : 15.07.2003

(51)Int.Cl.

B22D 17/30

B22D 17/20

(21)Application number : 2001-400915

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(22)Date of filing : 28.12.2001

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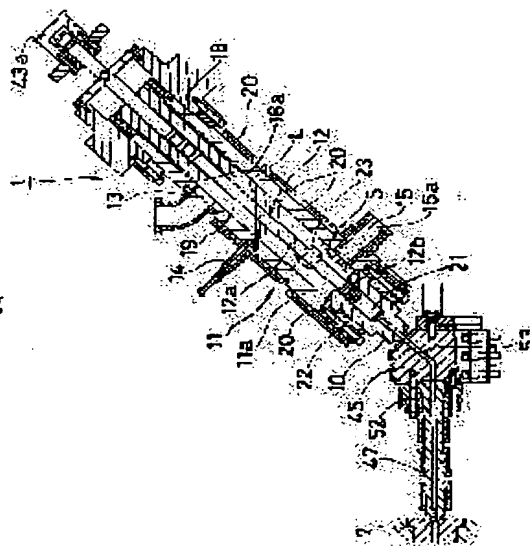
## (54) METAL FORMING MACHINE

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a metal forming machine which solves the problem of the vaporization of molten metal in a space of a molten metal holding cylinder and the cooling/sticking of the vaporized metal on the cylindrical wall, and solves the new problem such as the exhaust of impurities into molten metal by forming a member included in the molten metal holding cylinder of a single plunger and reducing the space on the surface of the molten metal.

**SOLUTION:** The molten metal holding cylinder 11 having the plunger 12 inserting an ejection head 12b freely movably forwards and backwards into the inner part of a weighing chamber 25 connected with a nozzle hole at the tip part of the cylinder 11, is disposed so as to incline the nozzle hole from the horizontal state at the lower side. The upper part side from a material charging hole 13 in the molten metal holding cylinder 11 is formed as non-space state with a plugging member 18.

The inner part of the molten metal holding cylinder is provided with only the single plunger inserted through the plugging member 18. A ratio of the inner diameter of the molten metal holding cylinder 11 to the rod diameter of the plunger 12 is made to  $\geq 2.5$  and the gap at the one side between the molten metal holding cylinder 11 and the outer diameter of the rod, is made to  $\geq 35$  mm.



## LEGAL STATUS

[Date of request for examination]

17.06.2003

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3624885  
[Date of registration] 10.12.2004  
[Number of appeal against examiner's decision  
of rejection]  
[Date of requesting appeal against examiner's  
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**CLAIMS**

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**[Claim(s)]**

[Claim 1] The dissolution metal maintenance cylinder which equipped with the heating means the periphery enclosure of the barrel which has nozzle opening at a tip, formed the measuring chamber linked to the nozzle opening in the point by diameter reduction, and established ingredient input port in the barrel upper part, In the metal-forming machine which fitted the injection head in the above-mentioned measuring chamber free [ an attitude ], consisted of a plunger for injection which carried out interior to the dissolution metal maintenance cylinder, and the level twist also made the dissolution metal maintenance cylinder incline to the down side, and installed nozzle opening The inside of the upper part by the lock out member from the ingredient input port of the above-mentioned dissolution metal maintenance cylinder Non-space and nothing, The metal-forming machine which carries out the interior of the single plunger to a dissolution metal maintenance cylinder through the lock out member, and is characterized by coming to constitute the ratio of the bore of the dissolution metal maintenance cylinder, and the diameter of a rod of the above-mentioned plunger the single-sided gap of 2.5 or more, a dissolution metal maintenance cylinder, and a rod outer diameter in 35mm or more.

[Claim 2] The above-mentioned lock-out member is a metal-forming machine according to claim 1 to which the inner end face close to ingredient input port is formed in an abbreviation perpendicular, among those an end face cuts down the space of the ingredient input-port bottom, and controls the evaporation of molten metal, and is characterized by to be located as a taper side which controls that the metal which evaporated carries out cooling adhesion in connection with the inclination of the above-mentioned dissolution metal maintenance cylinder.

[Claim 3] The above-mentioned dissolution metal maintenance cylinder is claim 1 and the metal-forming machine of two publications which are characterized by having the exhaust port of impurities generated inside, such as a sludge and a loss, to the lower part down side.

[Claim 4] It is the metal-forming machine according to claim 1 the above-mentioned plunger is connected with the driving gear of the back end section of the above-mentioned dissolution metal maintenance cylinder, carry out retreat actuation at the time of measuring of the metallic material in the above-mentioned nozzle member, and carry out [ being prepared in a dissolution metal maintenance cylinder so that it may move forward at the time of injection after measuring, and coming to prepare in the bulge member for convection-current generating to the rod of the plunger, and ] as the description.

[Claim 5] The above-mentioned ingredient input port is claim 1 and the metal-forming machine of two publications which are characterized by having the feeder of the metallic material which has migration of the metallic material of a solid state, and a quantum metering installation.

[Claim 6] The above-mentioned ingredient input port is claim 1 and the metal-forming machine of two publications which are characterized by having the feeder which has the fusion furnace and quantum metering installation of a metallic material of a liquid condition.

[Claim 7] The above-mentioned ingredient input port is claim 1 and the metal-forming machine of two publications which are characterized by having the feeder which has the fusion furnace and quantum metering installation of a metallic material of a thixotropy condition with which the solid phase of a solid-liquid coexistence condition or a solid-liquid coexistence condition

spheroidized.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the metal-forming machine which injects nonferrous metals, such as zinc, magnesium, or these alloys, to metal mold, and obtains metal goods.

[0002]

[Problem(s) to be Solved by the Invention] The nonferrous metal of a low-melt point point is fused like the case of plastic material within the heating cylinder which equipped rotation and shaft orientations with the screw for injection movable. After fusing it completely, accumulating it in a heating cylinder plenum chamber in the state of the liquid phase and measuring it, transporting the granular metallic material supplied from the posterior part of a heating cylinder ahead of a heating cylinder by screw rotation, carrying out injection restoration from the nozzle at the tip of a heating cylinder by screw advance at metal mold is being performed.

[0003] The technical problem at the time of adopting such injection molding as a metallic material is in melting of the metallic material by screw rotation, and the difficulty of migration and the instability of measuring. In the metallic material completely fused even in the liquid phase condition, since viscosity is small, it is hard to produce the migration force by screw rotation, so that it does not become as compared with plastic material. Moreover, since it is not generated, the screw retreat by \*\*\*\* cannot take place easily, and only by screw rotation, a pressure buildup to the extent that a metallic material puts back a screw back in the state of the liquid phase of hypoviscosity cannot become unstable, and cannot make measuring a constant rate each time, either.

[0004] Then, this invention person etc. developed the injection molding machine of the low-melt point metallic material indicated by JP,2001-375370,A as a new means to solve melting of the metallic material by the screw, and the technical problem of injection.

[0005] Stirring and the injection means which this injection molding machine was formed in the interior of a dissolution cylinder free [ rotation or an attitude ], So that a injection device may be constituted from equipment by the side of the dissolution cylinder back end which drives these means, internal molten metal may flow down the injection device with a self-weight and it may be accumulated in the measuring chamber in the point of a dissolution cylinder The stirring member which carried out downward diagonal installation of the nozzle member side to the mold clamping mechanism, and carried out intermittence formation of the stirring aerofoil of two or more articles of an outer diameter almost equal to a dissolution cylinder bore for the stirring and a injection means. It consists of a injection rod prepared in the center of a stirring member free [ sliding ], and an injection plunger at the tip of a stirring member which attached at the tip in one and was established in the above-mentioned measuring chamber free [ insertion ].

[0006] That the dissolution of the metallic material in a dissolution cylinder is efficiently performed by the temperature of heating from the outside and the metal molten metal produced previously in the injection molding machine of such a configuration, and become uniform [ temperature ], and measuring and injection of molten metal by the injection plunger are also stabilized etc. was that whose effectiveness of the improves much more rather than the case where a screw is adopted.

[0007] The improvement of the above-mentioned injection molding machine has this invention. That purpose By cutting down between a molten metal oil-level being absentminded as if the member by which interior is carried out to a dissolution metal maintenance cylinder being used as a single plunger It is in offering the metal-forming machine which can solve evaporation of the molten metal by the space of a dissolution metal maintenance cylinder, and cooling adhesion in the barrel wall of an evaporation metal, and can also solve new technical problems, such as discharge of the impurity in a metal molten metal.

[0008]

[Means for Solving the Problem] The dissolution metal maintenance cylinder which this invention for the above-mentioned purpose equipped with the heating means the periphery enclosure of the barrel which has nozzle opening at a tip, formed the measuring chamber linked to that nozzle opening in the point by diameter reduction, and established ingredient input port in the barrel upper part. In the metal-forming machine which fitted the injection head in the above-mentioned measuring chamber free [ an attitude ], consisted of a plunger for injection which carried out interior to the dissolution metal maintenance cylinder, and the level twist also made the dissolution metal maintenance cylinder incline to the down side, and installed nozzle opening The inside of the upper part by the lock out member from the ingredient input port of the above-mentioned dissolution metal maintenance cylinder Non-space and nothing. The interior of the single plunger is carried out to a dissolution metal maintenance cylinder

through the lock out member, and it comes to constitute the ratio of the bore of the dissolution metal maintenance cylinder, and the diameter of a rod of the above-mentioned plunger the single-sided gap of 2.5 or more, a dissolution metal maintenance cylinder, and a rod outer diameter in 35mm or more.

[0009] The inner end face close to ingredient input port is formed in an abbreviation perpendicular by the above-mentioned lock out member of this invention, among those in connection with the inclination of the above-mentioned dissolution metal maintenance cylinder, the space of the ingredient input port bottom is cut down, and an end face controls the evaporation of molten metal, and is located as a taper side which controls that the metal which evaporated carries out cooling adhesion.

[0010] The above-mentioned dissolution metal maintenance cylinder of this invention has the exhaust port of impurities generated inside, such as a sludge and a loss, to the lower part down side. The above-mentioned plunger is connected with the driving gear of the back end section of the above-mentioned dissolution metal maintenance cylinder. Retreat actuation is carried out at the time of measuring of the metallic material in the above-mentioned nozzle member, it is prepared in a dissolution metal maintenance cylinder so that it may move forward at the time of injection after measuring, and it comes to prepare the bulge member for convection-current generating in the rod of the plunger.

[0011] The above-mentioned ingredient input port of this invention is equipped with the feeder of the metallic material which has migration of the metallic material of a solid state, and a quantum metering installation, and ingredient input port is equipped with the feeder which has the fusion furnace and quantum metering installation of a metallic material of a liquid condition. Furthermore, ingredient input port is equipped with the feeder which has the fusion furnace and quantum metering installation of a metallic material of a thixotropy condition with which the solid phase of a solid-liquid coexistence condition or a solid-liquid coexistence condition spheroidized.

[0012] With the above-mentioned configuration, the rod of a plunger as a member in a dissolution metal maintenance cylinder only in being located in the center The ratio of the bore of a dissolution metal maintenance cylinder, and the diameter of a rod of a plunger by having constituted the single-sided gap of 2.5 or more, a dissolution metal maintenance cylinder, and a rod outer diameter in 35mm or more It increases rather than the case where the temperature of the molten metal in a barrel was stabilized, and \*\*\*\* carries out the interior of the plunger with a stirring shaft, and melting capacity improves.

[0013] Moreover, it is only that the rod of a plunger is located in the center in a dissolution metal maintenance cylinder. There is no generating of the ingredient bridge between the stirring shaft nursed by the old dissolution cylinder from not having a stirring means and a barrel wall. The promotion of evaporation of the metal by stirring of a molten metal is also prevented, and it becomes the thing excellent in effectiveness — wear is also reduced — and endurance like the moving part in the dissolution cylinder by which impurity diffusion by stirring is considered as a cause.

[0014] As for whenever [ tilt-angle / of the above-mentioned dissolution metal maintenance cylinder ], it is desirable to receive horizontally and to install a nozzle member side downward in [ include-angle ] 5-60 degrees. Although only the case where a dissolution metal maintenance cylinder is installed with mold clamp equipment as the inclination approach, and a dissolution metal maintenance cylinder may be installed, when the molten metal of convention capacity is in a dissolution metal maintenance cylinder, the amount only of molten metals in which a measuring chamber does not inhale the gas of an oil level is needed. It is installing only a dissolution metal maintenance cylinder in the include angle of 45 degrees as a suitable example.

[0015] Moreover, although it is desirable that it will be in a saturation state with the metallic fumes which evaporate from an oil level as for the space from ingredient input port to the oil level of a molten metal, if it becomes below the solidification temperature of the metal with which the top panel which seals a dissolution metal maintenance cylinder, and a wall surface evaporate, the solidified metal will adhere to a top panel or a wall surface. These can lessen adhesion solidification by the evaporation metal, when it meant having adhered with as, without dissolving, and it combined with oxygen and becoming an oxide \*\*\*\* also made the inside of the upper part with non-space by the lock out member from ingredient input port.

[0016] When the space from ingredient input port to the oil level of a molten metal is formed in the minimum of the taper side by the inner end face which furthermore approaches the ingredient input port of a lock out member, it is prevented that can perform now efficiently temperature control beyond the solidification temperature by heating of the top panel of the space section and a wall surface, consequently adhesion solidification of an evaporation metal is lost, and that solidification object mixes in a molten metal as an impurity behind. Moreover, since impurities generated in the metal molten metal by the exhaust port, such as a sludge and a loss, can be sampled with a molten metal, also when internal cleaning in a short period of time becomes unnecessary, stops operation and disassembles a dissolution cylinder, since it does not have a stirring means in a barrel, compaction of the assembly resolving time is achieved, and it can also become reduction of a manufacturing cost.

[0017]

[Embodiment of the Invention] Drawing 1 and drawing 2 dissolve the metallic material of a solid state, and show the operation gestalt which carries out injection restoration to metal mold.

[0018] The injection device which makes a subject the metal dissolution maintenance cylinder 11 (henceforth a dissolution cylinder) which one in drawing has the nozzle member 10 at the tip of a barrel, and has the plunger 12 for injection inside, 4 by which 2 is installed [ both ] in the top face of a machine stool 3 by the mold clamping mechanism is the plinth 4 of the injection device 1 installed free [ an attitude ] to the mold clamping mechanism 2. It has the stand 5 by board 5a of a Uichi Hidari pair toward which the top face inclined free [ revolution ] on a

posterior part, and the above-mentioned dissolution cylinder 11 has placed the inclination installation of the nozzle member side upside down to the mold clamping mechanism 2 at the stand 5.

[0019] The dissolution cylinder back end and the front end of the injection cylinder 43 are built over an oil hydraulic cylinder 42, and while the nozzle touch equipment 44 by the oil hydraulic cylinder 42 and rod 42a of a major axis fixes the tip of rod 42a to revolve, enabling free rotation, it attaches the cylinder back end firmly free [ rotation in a injection cylinder ], and is formed in the bearing member 46 of the both sides of the nozzle touch block 45 set up in the center of a tip of a plinth 4 at the both sides of the above-mentioned dissolution cylinder 11. In addition, the above-mentioned nozzle touch equipment 44 is [0020] which functions also as retreat equipment which faces repair and a maintenance of the injection device 1. In the member 41, the support shaft 40 has both ends in the board inside by which the top face was formed in the inclined plane of the sense among the include angles around 45 degrees, the above-mentioned stand 5 is attached in it, and on the support shaft 40, the leg of the back end section of the dissolution cylinder 11 attaches with the leg of the front end section of the injection cylinder 43, and holds the dissolution cylinder 11 at the include angle of 45 degrees.

[0021] Moreover, although the stand 5 omitted by a diagram to the gate type strike 6 installed on the back end section of the above-mentioned plinth 4, installation immobilization of the revolution is enabled, the above-mentioned nozzle touch block 45 is covered from the center of the interior of the strike 6, and the nozzle touch equipment 48 of the injection cylinder 47 which also formed the member 52 in the front face of this nozzle touch block 45 at the intermediary horizontal is arranged.

[0022] The oil hydraulic cylinder 49 of this nozzle touch equipment 48 The rod member 51 which it was fixed to the receiving part material 50 of the center of the inside of the plinth 6 installed to the machine stool 3, and was connected with the internal piston rod (drawing is omitted) The tip is connected with the above-mentioned nozzle touch block 45, a plinth 4 carries out attitude migration with the dissolution cylinder 11 of the top face of a stand 5 by attitude migration of the rod member 51, and it has been made to carry out the nozzle touch of the above-mentioned injection cylinder 47 to metal mold 7.

[0023] As the inside upper part of the above-mentioned nozzle touch block 45 is shown in drawing 2, it is formed in the inclination rear face located in a right angle to the axis of the nozzle member 10 of the above-mentioned dissolution cylinder 11, and the gate for nozzle touches is established on the inclination rear face. Moreover, even if it has carried out crookedness formation of the hot runner 53 which opens the above-mentioned nozzle member 47 and the above-mentioned nozzle member 10 for free passage and inclination installation of the dissolution cylinder 11 is carried out to the mold clamping mechanism 3 by this, inside the nozzle touch block, the nozzle touch was performed without the clearance, and has prevented leakage of the molten metal at the time of injection in it.

[0024] The above-mentioned dissolution cylinder 11 has ingredient input port 13 to the up side in the middle of barrel 11a, and down the ingredient input port 13, the oil-level detector 14 of a molten metal penetrates a detection plug to the wall of barrel 11a, and it has attached it. Moreover, the exhaust port 15 of impurities generated inside, such as a sludge and a loss, is formed in the lower part bottom of barrel 11a.

[0025] The feeder 16 of a granular metallic material is attached in the above-mentioned ingredient input port 13. This feeder 16 consists of level cylinder 16a and screw conveyor 16b of the interior rotated with the electric motor (not shown) formed in the cylinder edge, and is equipped with filling pipe 16c of inert gas, and the oxygen sensor 17. The amount of sending out of a granular ingredient adjusts control of the rotational frequency of screw conveyor 15b, and can measure the amount of supply now.

[0026] Moreover, as shown in drawing 2, the inside of the barrel of ingredient input port 12 to the upper part is closed by the lock out member 18 which approached the upper limb of ingredient input port 12, and prepared inner end-face 18a in barrel 11a, and serves as non-space. This lock out member 18 the axial material of the die length which reaches from [ near the upper limb of ingredient input port 12 ] to the barrel back end The plunger 12 which consists of what carried out the bolt stop of the outer edge to the barrel back end, and was airtightly fixed to it, and becomes the through tube drilled in the center of the lock out member 18 from rod 12a and injection head 12b at a tip without establishing a stirring means in the single condition Rod 12a is airtightly inserted in with a surrounding ring, and it has prepared free [ an attitude ] in the barrel till the place fitted in the measuring chamber 21 of the length as required which injection head 12b formed in the posterior part of the above-mentioned nozzle member 10.

[0027] Since the maintenance span of rod 12a is secured for a long time by having held rod 12a in the barrel to the bearing of a plunger 12 using the lock out member 18 by this major-axis material, even if maintenance of a plunger 12 is in the condition of a cantilever, it becomes easy to set a plunger 12 as this alignment to a measuring chamber 21, and a cardiac gap does not take place mutually in long-term use, but \*\*\*\* by eccentricity is prevented.

[0028] The rod back end of the above-mentioned plunger 22 is connected with piston rod 43a of the above-mentioned injection cylinder 43. Moreover, the bulge member 23 which makes rod 22a generate the convection current in a molten metal with shaft-orientations migration of rod 22a by the case is formed as the chain line shows. Since the location of this bulge member 23 will strike an oil level L at the time of plunger advance and will have bounded the molten metal when it is above the oil level L of a molten metal, it is desirable to approach the above-mentioned exhaust port 15 like the location where it sinks in the molten metal completely, or a part is absorbed in a molten metal, for example, illustration, and to be prepared. Moreover, the configuration of the bulge member 23 is determined by the plunger rate at the time of the viscosity of the dissolving metallic material, injection, and measuring etc., and can plan the homogeneity of molten metal temperature by reciprocation of the bulge member 23.

[0029] Although the size of the above-mentioned rod 12a changes with bores of the dissolution cylinder 11, as for

the ratio of the bore of the dissolution cylinder 11, and the diameter of a rod, it is desirable to carry out to 2.5 or more and to set up the single-sided gap of the dissolution cylinder 11 and a rod outer diameter as 35mm or more. Incidentally in the case of 115mm dissolution cylinder bore, the diameter of a rod serves as the range of 32-40mm from the above-mentioned ratio as a dimension.

[0030] Inner end-face 18a of the above-mentioned lock out member 18 is formed in the abbreviation perpendicular, among those end-face 18a is located in connection with the inclination of the dissolution cylinder 11 considering cutting down the space 19 of the ingredient input port 13 bottom, and controlling the evaporation of molten metal, and the metal which evaporated carrying out cooling adhesion as heating by the band-shaped electric heater 20 of the periphery enclosure of the dissolution cylinder 11, and a taper side controlled conjointly.

[0031] The inside of nozzle opening of the above-mentioned nozzle member 10 and the point of barrel 11a open for free passage is formed in the measuring chamber 21 of the length as required whose diameter was reduced to the minor diameter about 8 to 15% rather than the dissolution cylinder bore. Although the diameter of the inside of the posterior part of the nozzle member 10 attached at the tip of a barrel is reduced smaller than a dissolution cylinder bore and the inside of the posterior part is made into the above-mentioned measuring chamber 21 which was open for free passage in barrel 11a in the example of illustration Although omitted not in the thing especially limited to such structure but in drawing, you may be the structure which attaches the nozzle member 10 firmly at the tip of a barrel and which reduced the diameter of the bore of the point material 22, and attached the nozzle tip in a measuring chamber 21, nothing, and its point material 22.

[0032] As are shown in drawing 4, and injection head 12b of the above-mentioned plunger 12 equips a peripheral face with the check valve 25 which laid the seal ring 24 underground free [ an attitude ] in a periphery enclosure and can open and close the passage 26 formed between the check valve 25 and injection head 12b by attachment and detachment with the back end side of a check valve 25, and seat ring 25a of a plunger posterior part, it is fitted in the measuring chamber 21 in a nozzle member free [ migration ].

[0033] In the plunger 12 equipped with such injection head 12b Since it is sealed by the plug produced by cooling solidification of the molten metal with which nozzle opening of the above-mentioned injection cylinder 47 remained after injection, if retreat migration of the plunger 12 is carried out from an advance location in the above-mentioned injection cylinder 43 It shifts to a before side by \*\*\*\* and \*\*\*\*\* of a injection head periphery according [ a check valve 25 ] to the negative pressure in a measuring chamber, it moves, and will be in a valve-opening condition, and measuring is performed until it flows into the measuring chamber 21 where a molten metal is being extended with retreat migration from the above-mentioned passage 26 and stops in the retreat limit position of illustration of injection head 12b.

[0034] Moreover, although carried out by injection to the metal mold 7 of a measuring ingredient applying an injection pressure to a plunger 12 from the injection cylinder 43, since nozzle opening of the injection cylinder 47 is closed by the plug as mentioned above in this case, \*\*\*\*\* goes up, this serves as injection load pressure, a check valve 25 carries out retreat migration, clausilium is performed by this, and the back flow of a measuring ingredient comes to be prevented. Furthermore a plug will be extruded by the rise of an injection pressure at a metal mold side, and a measuring ingredient will be injected by metal mold 7 from nozzle opening.

[0035] The operation gestalt shown in drawing 3 attaches in ingredient input port 13 the small fusion furnace 28 which equipped the perimeter with the band-shaped electric heater 27, supplies with a liquid the metallic material which dissolved with the fusion furnace 28 to the dissolution cylinder 11, and shows the case where it enables it to inject by holding the liquid condition with the above-mentioned band heater 20 of the perimeter of a dissolution cylinder. The valve rod 29 which can be artificially operated in a fusion furnace 26 is formed in the outflow way 30, and it enables it for the switching operation of the valve rod 29 to have performed measuring and supply of a melting metallic material.

[0036] Next, shaping of the Magnesium alloy by the making machine of the above-mentioned configuration is explained. While heating the dissolution cylinder 11 in temperature of 620 degrees - about 680 degrees C with the band heater 20 of a periphery first and making the interior with the elevated temperature more than melting temperature. Moreover, inert gas, such as argon gas, is poured in into a dissolution cylinder from above-mentioned gas supply impregnation member 16c, and the inside of a dissolution cylinder is made with an inert gas ambient atmosphere.

[0037] If the temperature of the dissolution cylinder 11 reaches laying temperature, a granular metallic material will be supplied in the dissolution cylinder 11 from the above-mentioned feeder 16. Since the dissolution cylinder 11 inclines downward, a metallic material falls to the lowest edge of the dissolution cylinder 11 with a self-weight, and is dissolved. Ingredient measuring in this case supplies many metallic materials of \*\*\*\* weight slightly from 1 time of injection capacity, or supplies the metallic material for multiple times of more [ slightly ] weight than the injection weight of multiple times. After sensing the molten metal oil-level level of the dissolution cylinder 11 with the above-mentioned sensor 14, stopping and the amount's of supply suspending setting shots-per-hour supply, it is repeated again and holds fixed molten metal oil-level level.

[0038] In the case of the liquid in which the metallic material supplied was beforehand dissolved by the fusion furnace 28, after supplying to the dissolution cylinder 11 held at laying temperature, a liquefied condition is held with the temperature of heating of the dissolution cylinder 11 and the molten metal in a dissolution cylinder.

[0039] In the case of the metallic material to which the metallic material supplied changed the metallic material beforehand heated in the solid-liquid coexistence condition, and the solidified usual metallic material into the thixotropy condition with the separate fusion furnace as well as the case of the above-mentioned solid state or a

liquid condition, it supplies, and is held by the dissolution cylinder 11 at a heating condition.

[0040] If a plunger 12 carries out retreat migration of the molten metal, the metal molten metal in a dissolution cylinder will flow into a measuring chamber 21 by the above-mentioned actuation in injection head 12b, and measuring will be performed. A plunger 12 arrives at a retreat limit position, it becomes measuring termination, and a plunger 12 pressurizes the molten metal which changed to advance migration and was measured to the measuring chamber 21. Thereby, a check valve 25 closes the valve by the above-mentioned actuation, and injection restoration of the measuring molten metal is carried out at the metal mold 7 by which the mold clamp was carried out by passing a hot runner and the injection cylinder 47 from the nozzle. After the completion of injection, a plunger 12 moves to a retreat limit position, and next measuring is performed.

[0041] Since the impurities S generated in the molten metal by prolonged operation, such as a sludge and a loss, sink near an exhaust port 15 by the inclination of the dissolution cylinder 11, they can remove cap 15a at a suitable stage, and can sample it with a molten metal. Long-term operation is attained by that which can perform internal cleaning, without this stopping operation and disassembling the dissolution cylinder 11.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the side elevation of the low-melt point metal-forming machine concerning this invention.

[Drawing 2] It is a dissolution cylinder and a vertical section side elevation same as the above.

[Drawing 3] It is the partial vertical section side elevation of other operation gestalten.

[Drawing 4] It is the vertical section side elevation of the head of a plunger.

[Description of Notations]

1 Injection Device

2 Mold Clamping Mechanism

7 Metal Mold

10 Nozzle Member

11 Dissolution Cylinder

12 Plunger for Injection

12a The rod of a plunger

12b Injection head

13 Ingredient Input Port

15 Exhaust Port

16 Feeder

18 Lock Out Member

18a The inner end face of a lock out member

19 Space

20 Band Heater

21 Measuring Chamber

23 Bulge Member for Convection Current

25 Check Valve

28 Fusion Furnace

47 Injection Cylinder

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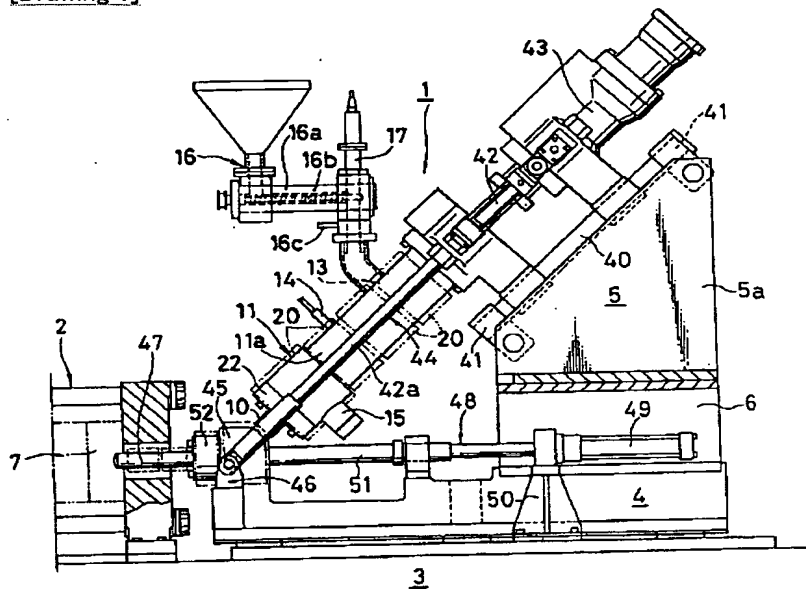
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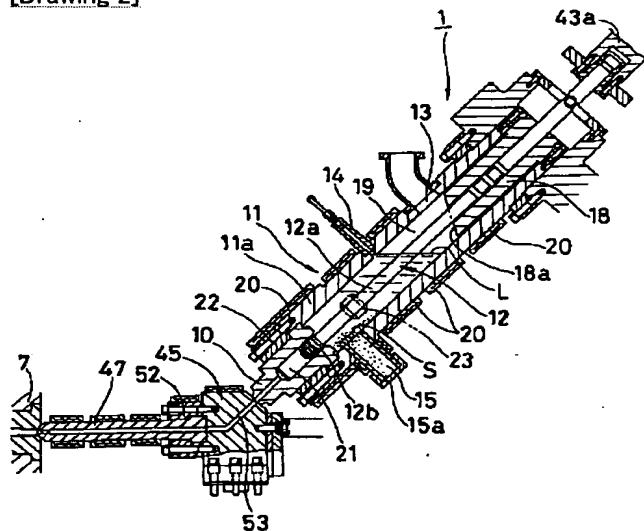
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## DRAWINGS

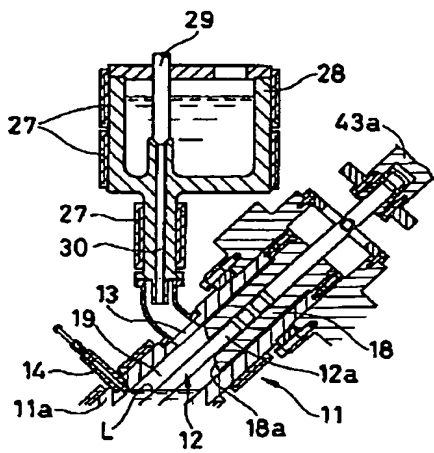
[Drawing 1]



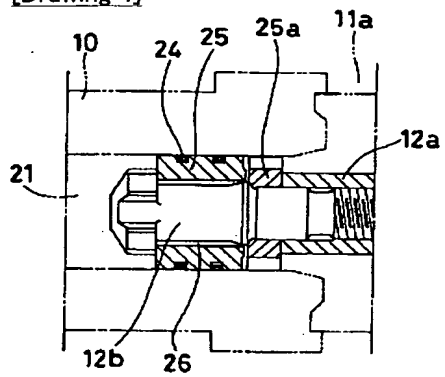
[Drawing 2]



[Drawing 3]



[Drawing 4]



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CORRECTION OR AMENDMENT

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[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law  
 [Section partition] The 2nd partition of the 2nd section  
 [Publication date] July 8, Heisei 16 (2004. 7.8)

[Publication No.] JP,2003-200249,A (P2003-200249A)  
 [Date of Publication] July 15, Heisei 15 (2003. 7.15)  
 [Application number] Application for patent 2001-400915 (P2001-400915)  
 [The 7th edition of International Patent Classification]

B22D 17/30  
 B22D 17/20

[FI]

B22D 17/30        Z  
 B22D 17/20        G  
 B22D 17/20        Z

[Procedure revision]  
 [Filing Date] June 17, Heisei 15 (2003. 6.17)  
 [Procedure amendment 1]  
 [Document to be Amended] Specification  
 [Item(s) to be Amended] 0007  
 [Method of Amendment] Modification  
 [The contents of amendment]  
 [0007]

It is in the improvement of the above-mentioned injection molding machine, and this invention is that purpose, While using as a single plunger the member by which interior is carried out to a dissolution metal maintenance cylinder, it is in offering the metal-forming machine which can solve evaporation of the molten metal by the space of a dissolution metal maintenance cylinder, and cooling adhesion in the barrel wall of an evaporation metal, and can also solve new technical problems, such as discharge of the impurity in a metal molten metal, by cutting down between a molten metal oil-level being absentminded.

[Procedure amendment 2]  
 [Document to be Amended] Specification  
 [Item(s) to be Amended] 0023  
 [Method of Amendment] Modification  
 [The contents of amendment]  
 [0023]

As the inside upper part of the above-mentioned nozzle touch block 45 is shown in drawing 2, it is formed in the inclination rear face located in a right angle to the axis of the nozzle member 10 of the above-mentioned dissolution cylinder 11, and the gate for nozzle touches is established on the inclination rear face. Moreover, even if it has carried out crookedness formation of the hot runner 53 which opens the above-mentioned nozzle member 47 and the above-mentioned nozzle member 10 for free passage and inclination installation of the dissolution cylinder 11 is carried out to the mold clamping mechanism 2 by this, inside the nozzle touch block, the nozzle touch was performed without the clearance, and has prevented leakage of the molten metal at the time of injection in it.

[Procedure amendment 3]  
 [Document to be Amended] Specification  
 [Item(s) to be Amended] 0025  
 [Method of Amendment] Modification  
 [The contents of amendment]  
 [0025]

The feeder 16 of a granular metallic material is attached in the above-mentioned ingredient input port 13. This

feeder 16 consists of level cylinder 16a and screw conveyor 16b of the interior rotated with the electric motor (not shown) formed in the cylinder edge, and is equipped with filling pipe 16c of inert gas, and the oxygen sensor 17. The amount of sending out of a granular ingredient is adjusted by control of the rotational frequency of screw conveyor 16b, and can measure the amount of supply now.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0026

[Method of Amendment] Modification

[The contents of amendment]

[0026]

Moreover, as shown in drawing 2, the inside of the barrel of ingredient input port 13 to the upper part is closed by the lock out member 18 which approached the upper limb of ingredient input port 13, and prepared inner end-face 18a in barrel 11a, and serves as non-space. This lock out member 18 should carry out the bolt stop of the outer edge for the axial material of the die length which reaches from [ near the upper limb of ingredient input port 12 ] to the barrel back end to the barrel back end. The plunger 12 which consists of what was fixed airtightly and becomes the through tube drilled in the center of the lock out member 18 from rod 12a and injection head 12b at a tip without establishing a stirring means in the single condition Rod 12a is airtightly inserted in with a surrounding ring, and it has prepared free [ an attitude ] in the barrel till the place fitted in the measuring chamber 21 of the length as required which injection head 12b formed in the posterior part of the above-mentioned nozzle member 10.

[Procedure amendment 5]

[Document to be Amended] Specification

[Item(s) to be Amended] 0028

[Method of Amendment] Modification

[The contents of amendment]

[0028]

The rod back end of the above-mentioned plunger 12 is connected with piston rod 43a of the above-mentioned injection cylinder 43. Moreover, the bulge member 23 which makes rod 12a generate the convection current in a molten metal with shaft-orientations migration of this rod 12a by the case is formed as the chain line shows. Since the location of this bulge member 23 will strike an oil level L at the time of plunger advance and will have bounded the molten metal when it is above the oil level L of a molten metal, it is desirable to approach the above-mentioned exhaust port 15 like the location where it sinks in the molten metal completely, or a part is absorbed in a molten metal, for example, illustration, and to be prepared. Moreover, the configuration of the bulge member 23 is determined by the plunger rate at the time of the viscosity of the dissolving metallic material, injection, and measuring etc., and can plan the homogeneity of molten metal temperature by reciprocation of the bulge member 23.

[Procedure amendment 6]

[Document to be Amended] Specification

[Item(s) to be Amended] 0030

[Method of Amendment] Modification

[The contents of amendment]

[0030]

Inner end-face 18a of the above-mentioned lock out member 18 is formed in the abbreviation perpendicular, among those end-face 18a is located in connection with the inclination of the dissolution cylinder 11 considering cutting down the space 19 of the ingredient input port 13 bottom, and controlling the evaporation of molten metal, and the metal which evaporated carrying out cooling adhesion as heating by the band heater 20 of the periphery enclosure of the dissolution cylinder 11, and a taper side controlled conjointly.

[Procedure amendment 7]

[Document to be Amended] Specification

[Item(s) to be Amended] 0035

[Method of Amendment] Modification

[The contents of amendment]

[0035]

The operation gestalt shown in drawing 3 attaches in ingredient input port 13 the small fusion furnace 28 which equipped the perimeter with the band heater 27, supplies with a liquid the metallic material which dissolved with the fusion furnace 28 to the dissolution cylinder 11, and shows the case where it enables it to inject by holding the liquid condition with the above-mentioned band heater 20 of the perimeter of a dissolution cylinder. The valve rod 29 which can be artificially operated in a fusion furnace 28 is formed in the outflow way 30, and it enables it for the switching operation of the valve rod 29 to have performed measuring and supply of a melting metallic material.

[Procedure amendment 8]

[Document to be Amended] Specification

[Item(s) to be Amended] 0041

[Method of Amendment] Modification

[The contents of amendment]

[0041]

Since the impurities S generated in the molten metal by prolonged operation, such as a sludge and a loss, sink near

an exhaust port 15 by the inclination of the dissolution cylinder 11, they can remove cap 15a at a suitable stage, and can sample it with a molten metal. Since internal cleaning can be performed without this stopping operation and disassembling the dissolution cylinder 11, long-term operation is attained.

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[Translation done.]